

FCC TEST REPORT

REPORT NO.: RF940410H01

MODEL NO.: M-RBG112

RECEIVED: Apr. 10, 2005

TESTED: Apr. 14, 2005

ISSUED: Apr. 19, 2005

APPLICANT: LOGITECH FAR EAST LTD.

ADDRESS: #2 Creation Rd. 4, Science-Based Ind. Park
Hsinchu Taiwan, R.O.C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien,
Taiwan, R.O.C.

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ILAC MRA



No. 2177-01

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1 CERTIFICATION

PRODUCT : Cordless Mouse
BRAND NAME : Logitech
MODEL NO : M-RBG112
TESTED: Apr. 14, 2005
APPLICANT : LOGITECH FAR EAST LTD.
STANDARDS : 47 CFR Part 15, Subpart C(Section 15.227)
ANSI C63.4: 2003

The above equipment (Model: M-RBG112) has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Carol Liao , **DATE:** Apr. 19, 2005
(Carol Liao)

TECHNICAL
ACCEPTANCE : Hank Chung , **DATE:** Apr. 19, 2005
Responsible for RF (Hank Chung)

APPROVED BY : Eric Lin , **DATE:** Apr. 19, 2005
(Eric Lin, Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
15.207	Conducted Emission Test	NA	Power supply is 1.5VDC from battery
15.227 / 15.209	Radiated Emission Test	PASS	Minimum passing margin is -14.40 dB at 54.08 MHz

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Cordless Mouse
MODEL NO.	M-RBG112
POWER SUPPLY	1.5VDC from battery
MODULATION TYPE	FSK
CARRIER FREQUENCY OF EACH CHANNEL	27.045 MHz, 27.195MHz
NUMBER OF CHANNEL	2
ANTENNA TYPE	Loop antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is the transmitter part of Cordless Mouse.
2. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

There are two channels have been pre-tested in our facility as following:

Pre-test Mode	Frequency
1	27.045MHz
2	27.195MHz

NOTE: 27.045MHz, the worst case, was chosen for final test and it's data was recorded in this report.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is the transmitter part of a Cordless Mouse. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C (Section 15.227)

ANSI C63.4-2003

All tests have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

4 EMISSION TEST

4.1 RADIATED EMISSION & OCCUPIED BANDWIDTH MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.227 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)	
	Peak	Average
26.96-27.28	100	80

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Spectrum Analyzer	8594E	3710A04861	Sep. 23, 2005
ADVANTEST Spectrum Analyzer	R3271A	85060311	Jun. 29, 2005
CHASE RF Pre_Amplifier	CPA9232	1057	Aug 06, 2005
HP Pre_Amplifier	8449B	3008A01922	Oct. 13, 2005
ROHDE & SCHWARZ Test Receiver	ESCS30	100287	Dec. 08, 2005
CHASE Broadband Antenna	VULB9168	138	Dec. 21, 2005
Schwarzbeck Horn_Antenna	BBHA9120	D124	Jun. 16, 2005
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 30, 2006
SCHWARZBECK Biconical Antenna	VHBA9123	459	Jun. 26, 2006
SCHWARZBECK Periodic Antenna	UPA6108	1148	Jun. 26, 2006
R&S Loop Antenna	HFH2-Z2	881058/15	Nov. 03. 2005
RF Switches (ARNITSU)	CS-201	1565157	Jul. 15, 2005
RF CABLE (Chaintek) 1GHz-20GHz	SF102	22054-2	Nov. 15. 2005
RF Cable(RICHTEC)	9913-30M	STCCAB-30M-1GHz-021	Jul. 15, 2005
Software	ADT_Radiated_V 5.14	NA	NA
CHANCE MOST Antenna Tower	AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

- Note: 1. The calibration interval of the above test instruments is 12 months (36 months for Periodic Antenna) and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 3. The test was performed in ADT Open Site No. C.
 4. The FCC Site Registration No. is 656396.
 5. The VCCI Site Registration No. is R-1626.
 6. The CANADA Site Registration No. is IC 4824-3.
 7. All frequency less than 30MHz are tested by The R&S Loop Antenna
 8. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4.

Measurement	Value
Radiated emissions (30MHz-1GHz)	2.98 dB
Radiated emissions (1GHz ~18GHz)	2.21 dB
Radiated emissions (18GHz ~20GHz)	1.88 dB

4.1.3 TEST PROCEDURE

Part 1 – Radiated Emission

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.

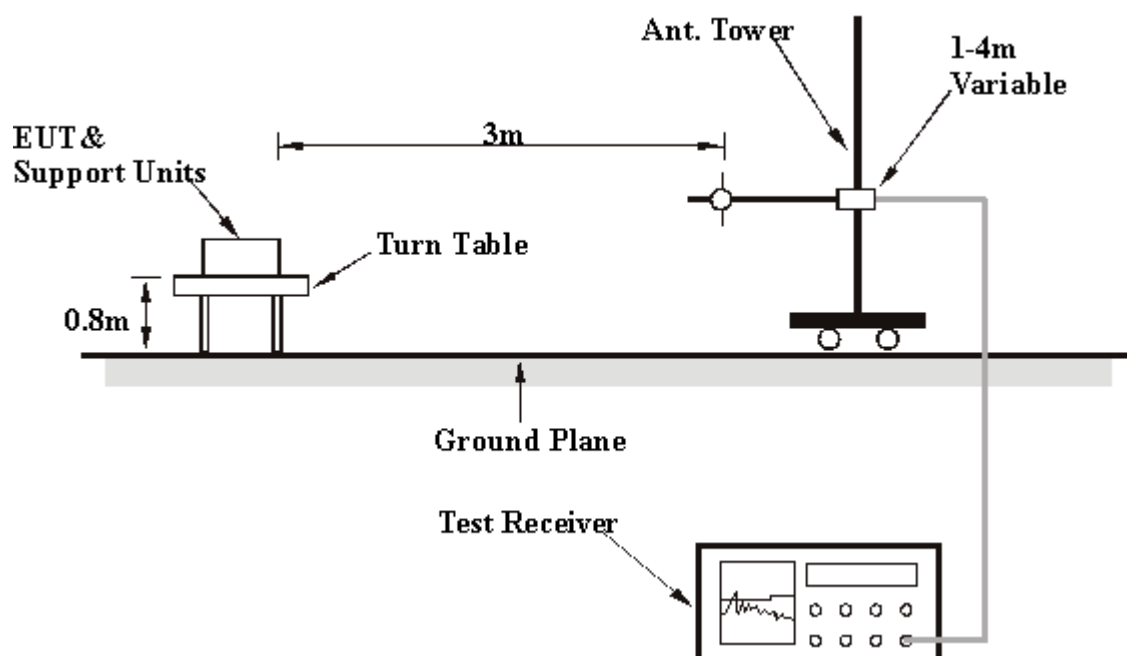
Part 2 –Band edges

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 10kHz with suitable frequency range from 26.96 ~ 27.28 MHz. The band edges was measured and recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP (RADIATED EMISSION)



For the actual test configuration, please refer to the related item in this test report - Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITION

Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.

4.1.7 TEST RESULT (RADIATED EMISSION)

EUT	Cordless Mouse	MODEL	M-RBG112
FREQUENCY RANGE	Below 1000 MHz	INPUT POWER	1.5VDC
ENVIRONMENTAL CONDITIONS	18 deg. C, 72 % RH, 977 hPa	DETECTOR FUNCTION & BANDWIDTH	Peak / Quasi-Peak / Average 120 kHz
TEST BY	Sky Liao		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	54.08	25.60 QP	40.00	-14.40	1.62 H	61	11.30	14.30
2	81.12	18.50 QP	40.00	-21.50	1.53 H	198	8.80	9.70
3	135.21	19.20 QP	43.50	-24.30	1.04 H	297	6.40	12.70
4	162.30	17.60 QP	43.50	-25.90	1.38 H	13	3.90	13.60
5	243.40	18.60 QP	46.00	-27.40	1.44 H	240	5.60	13.00
6	324.54	18.90 QP	46.00	-27.10	1.16 H	100	2.40	16.60
7	405.63	17.10 QP	46.00	-28.90	1.27 H	87	-1.50	18.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	54.08	20.60 QP	40.00	-19.40	1.00 V	301	6.30	14.30
2	135.21	24.70 QP	43.50	-18.80	1.20 V	126	12.00	12.70
3	189.22	21.50 QP	43.50	-22.00	1.05 V	286	9.50	11.90
4	216.36	20.20 QP	46.00	-25.80	1.00 V	5	8.40	11.90
5	243.41	20.80 QP	46.00	-25.20	1.16 V	180	7.80	13.00
6	324.54	20.60 QP	46.00	-25.40	1.00 V	13	4.10	16.60
7	405.62	23.80 QP	46.00	-22.20	1.00 V	197	5.20	18.50

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.

4.1.8 TEST RESULT (RADIATED EMISSION)

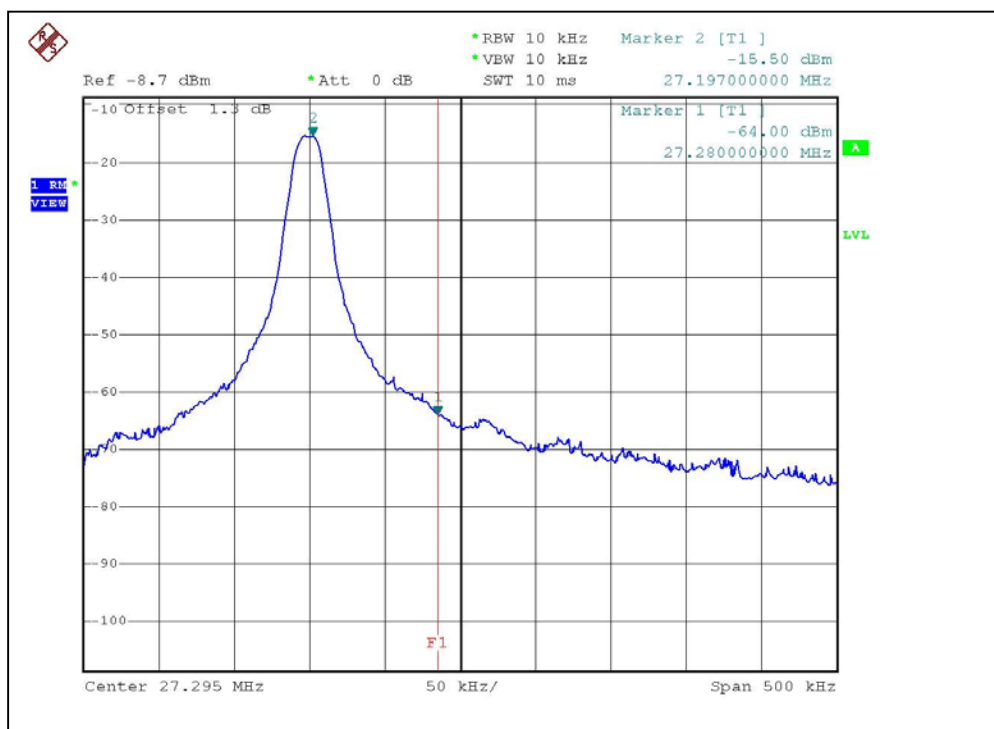
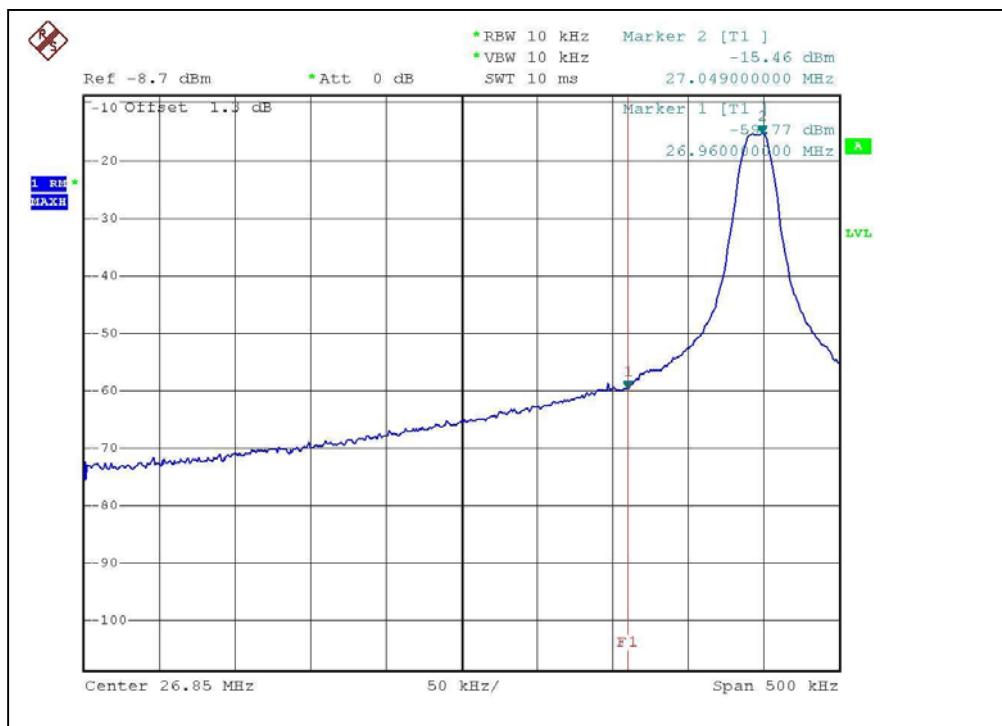
EUT	Cordless Mouse	MODEL	M-RBG112
FREQUENCY RANGE	Below 30 MHz	INPUT POWER	1.5VDC
ENVIRONMENTAL CONDITIONS	22 deg. C, 68 % RH, 977 hPa	DETECTOR FUNCTION & BANDWIDTH	Peak / Quasi-Peak / Average 120 kHz
TEST BY	Rex Huang		

LOOP ANTENNA TEST DISTANCE: AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*27.045	47.0 PK	100.00	-53.00	2.63	192	45.2	1.8
2	*27.045	43.9 AV	80.00	-36.10	2.63	192	42.1	1.8

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.

4.1.9 TEST RESULTS (BAND EDGES MEASUREMENT)

27.045MHz



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST



6 INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA, CSA
R.O.C.	CNLA, BSMI, DGT
Netherlands	Telefication
Singapore	PSB, GOST-ASIA (MOU)
Russia	CERTIS (MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Email: service@adt.com.tw

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.